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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/997,396	11/28/2001	Juha Hujanen	ASMMC.020AUS	2351

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EXAMINER	
VU, DAVID	

ART UNIT	PAPER NUMBER
2818	

DATE MAILED: 01/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/997,396	HUJANEN ET AL.
	Examiner	**Art Unit**
	DAVID VU	2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 10 November 2005.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-53 is/are pending in the application.

4a) Of the above claim(s) 33-45 and 51 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-32,46-50,52 and 53 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 11/28/01 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 1-32, 46-50 and 52-53 are rejected under 35 U. S. C. 102(e) as being anticipated by Gates et al. (US 6,203,613, herein after Gates).

Regarding claims 1-6, 9 and 11, Gates discloses in Example 8 (Col. 11, lines 24-65) a method of fabricating a magnetic memory cell, comprising: providing a substrate on which the magnetic memory cell is formed; depositing a first ferromagnetic layer (Mn, Fe); depositing a dielectric layer (Al_2O_3) over the first ferromagnetic layer; and depositing a second ferromagnetic layer (Co) over the dielectric layer, wherein (Mn, Fe/ Al_2O_3 / Co) layers is formed by atomic layer deposition (ALD). The thickness of the multilayer structure (Mn, Fe/ Al_2O_3 / Co) is determined by the number of cycles run. Gates's invention is also directed to depositing a multicomponent or multilayer metal film on a substrate, under ALD conditions, using a metal nitrate-containing precursor $M(NO_3)_x$ wherein M is a metal selected from the group consisting of Ti, Ga, Zr, Sn, Co, V, Pt, Pd, Fe, Ni, Mo, W, Ag, Au, Hf, Cr, Cu, Mn, La, Y, Al, Gd, Nd, Sm, Si,

Nb, Ta, and In; and x is the valence of M. The precursors $M(NO_3)_x$ was formed by ALD and subsequently using hydrogen reduction to selectively deposit multilayer metal films onto substrates.

Regarding claim 7, Gates discloses that depositing the first ferromagnetic layer by ALD comprises depositing a metal oxide by ALD and subsequently reducing the metal oxide to elemental metal (col. 11, lines 30-45 and col. 4, lines 40-51).

Regarding claim 8, Gates discloses that "A yet further object of the present invention is to provide an ALD process using a metal nitrate-containing precursor to form a complex multilayer structure which contains alternating films of metal oxides, metal nitrides and metals <u>in any combination</u>" (col. 3, lines 63-67) and " The present invention describes the use of metal nitrate-containing precursors, $M(NO_3)_x$ to form metal-containing films by any ALD method. <u>The term "metal-containing films" includes metal oxides, metal nitrides, elemental metal or any combination or mixtures thereof including multilayers and multicomponent.</u> The precursors of the present invention are used with a co-reactant gas such as an oxidizing agent, a reducing agent or a nitriding agent in forming metal-containing films by ALD. In the above formula, M is a metal selected from the group consisting of Ti, Ga, Zr, Sn, Co, V, Cr, Hf, Cu, Mn, La, Y, Al, Gd, Nd, Sm, Si, Nb, Ta and In; and x is the valence state of M" (col. 4, lines 40-51). Therefore, the limitation "wherein the elemental metal comprises cobalt" (as recited in claim 8) is inherent in the product of the prior art (Gates et al.).

Regarding claim 10, Gates discloses that depositing the second ferromagnetic layer comprises depositing a metal oxide by ALD and subsequently reducing the metal oxide to elemental metal (col. 11, lines 55-65 and col. 4, lines 40-51).

Regarding claim 12, Gates discloses that the first ferromagnetic layer (10nm MnFe) (col. 11, lines 44-45) has a lower magnetic permeability than the second ferromagnetic layer (100nm Co) (Col. 11, lines 64-65).

Regarding claim 13, Gates discloses that the first ferromagnetic layer (10nm MnFe) (col. 11, lines 44-45) is thinner than the second ferromagnetic layer (100nm Co) (Col. 11, lines 64-65).

Regarding claim 14, Gates discloses a method of fabricating a magnetic memory cell, comprising: providing a substrate on which the magnetic memory cell is formed (col. 11, lines 24-29); depositing a first magnetic layer (Mn, Fe) on the substrate; forming a dielectric layer (Al_2O_3) over the first magnetic layer; depositing a magnetic metal oxide layer {$Co(NO3)_x$} over the dielectric layer by atomic layer deposition (ALD); and reducing the magnetic metal oxide layer to a magnetic elemental metal layer (col. 11, lines 55-65 and col. 4, lines 40-51). The thickness of the multilayer structure (Mn, Fe/ Al_2O_3 / Co) is determined by the number of cycles run.

Regarding claims 15-19, Gates discloses a method of fabricating a magnetic memory cell, comprising: providing a substrate on which the magnetic memory cell is formed (col. 11, lines 24-29). Gates also discloses that "A yet further object of the present invention is to provide an ALD process using a metal nitrate-containing precursor to form a complex multilayer structure which contains alternating films of metal oxides, metal nitrides and metals <u>in any combination</u>"

(col. 3, lines 63-67) and " The present invention describes the use of metal nitrate-containing precursors, $M(NO_3)_x$ to form metal-containing films by any ALD method. The term "metal-containing films" includes metal oxides, metal nitrides, elemental metal or any combination or mixtures thereof including multilayers and multicomponent. The precursors of the present invention are used with a co-reactant gas such as an oxidizing agent, a reducing agent or a nitriding agent in forming metal-containing films by ALD. In the above formula, M is a metal selected from the group consisting of Ti, Ga, Zr, Sn, Co, V, Cr, Hf, Cu, Mn, La, Y, Al, Gd, Nd, Sm, Si, Nb, Ta and In; and x is the valence state of M" (col. 4, lines 40-51). Therefore, the limitation "forming a first magnetic layer on the substrate; depositing a first non-magnetic metal oxide layer over the first magnetic layer; converting the first non-magnetic metal oxide layer to a first non-magnetic metal layer; depositing an insulating layer on the first non-magnetic metal layer; depositing a second non-magnetic metal oxide layer by atomic layer deposition (ALD); converting the second non-magnetic metal oxide layer to a second non-magnetic metal layer; and depositing a second magnetic layer on the second non-magnetic metal layer" (as recited in claim 15) is inherent in the product and process of the prior art (Gates et al.).

Regarding claims 20-25, 27, 28 and 30, Gates discloses a method of fabricating a magnetic structure, comprising: depositing a plurality of metal oxide layers on a substrate by atomic layer deposition (ALD); and subsequently converting at least one of the metal oxide layers to elemental metal layers, wherein at least one of the metal oxide layers is magnetic {See Example 8 (Col. 11, lines 24-65)}. The thickness of the magnetic layer is determined by the number of cycles run.

Regarding claims 26, 29 and 31-32, Gates discloses that "A yet further object of the present invention is to provide an ALD process using a metal nitrate-containing precursor to form a complex multilayer structure which contains alternating films of metal oxides, metal nitrides and metals <u>in any combination</u>" (col. 3, lines 63-67) and " The present invention describes the use of metal nitrate-containing precursors, $M(NO_3)_x$ to form metal-containing films by any ALD method. <u>The term "metal-containing films" includes metal oxides, metal nitrides, elemental metal or any combination or mixtures thereof including multilayers and multicomponent.</u> The precursors of the present invention are used with a co-reactant gas such as an oxidizing agent, a reducing agent or a nitriding agent in forming metal-containing films by ALD. In the above formula, M is a metal selected from the group consisting of Ti, Ga, Zr, Sn, Co, V, Cr, Hf, Cu, Mn, La, Y, Al, Gd, Nd, Sm, Si, Nb, Ta and In; and x is the valence state of M" (col. 4, lines 40-51). Therefore, the limitations "wherein depositing the plurality of metal oxide layers comprises, in order: depositing a first magnetic metal oxide layer, depositing a first non-magnetic metal oxide layer, depositing an insulating layer, depositing a second non magnetic metal oxide layer, and depositing a second magnetic metal oxide layer " (as recited in claim 26); "wherein at least one of the metal oxide layers comprises a ferromagnetic oxide selected from the group consisting of magnetite (Fe_3O_4), CrO_2, manganite perovskites doped with alkaline earth metals and metal oxide superlattices" (as recited in claim 29); "wherein the magnetic nanolaminate comprises at least one non-magnetic metal" (as recited in claim 31) and "wherein the non-magnetic metal is copper" (as recited in claim 32) are inherent in the product and process of the prior art (Gates et al.).

Regarding claims 46-50, Gates discloses a method of fabricating a magnetic memory cell, comprising: providing a substrate on which the magnetic memory cell is formed (col. 11, lines 24-29). Gates also discloses that "A yet further object of the present invention is to provide an ALD process using a metal nitrate-containing precursor to form a complex multilayer structure which contains alternating films of metal oxides, metal nitrides and metals <u>in any combination</u>" (col. 3, lines 63-67) and " The present invention describes the use of metal nitrate-containing precursors, $M(NO_3)_x$ to form metal-containing films by any ALD method. <u>The term "metal-containing films" includes metal oxides, metal nitrides, elemental metal or any combination or mixtures thereof including multilayers and multicomponent.</u> The precursors of the present invention are used with a co-reactant gas such as an oxidizing agent, a reducing agent or a nitriding agent in forming metal-containing films by ALD. In the above formula, M is a metal selected from the group consisting of Ti, Ga, Zr, Sn, Co, V, Cr, Hf, Cu, Mn, La, Y, Al, Gd, Nd, Sm, Si, Nb, Ta and In; and x is the valence state of M" (col. 4, lines 40-51). Therefore, the limitations "depositing a first ferromagnetic layer by ALD, depositing a conductive layer over the first ferromagnetic layer, and depositing a second ferromagnetic layer over the conductive layer " (as recited in claim 46); "wherein the conductive layer is deposited by atomic layer deposition" (as recited in claim 47); "wherein the second ferromagnetic layer is deposited by atomic layer deposition" (as recited in claim 48); "wherein the first ferromagnetic layer comprises NiFe and the second ferromagnetic layer comprises Co" (as recited in claim 49) and "wherein the conductive layer comprises Cu" (as recited in claim 50) are inherent in the product and process of the prior art (Gates et al.).

Regarding claims 52-53, Gates discloses a method of fabricating a magnetic memory cell, comprising: providing a substrate on which the magnetic memory cell is formed (col. 11, lines 24-29); depositing a first ferromagnetic layer (Mn, Fe) on the substrate; forming a dielectric layer (Al_2O_3) over the first magnetic layer; depositing a second ferromagnetic metal oxide layer{$Co(NO3)_x$}over the dielectric layer by atomic layer deposition (ALD); and subsequently reducing the magnetic metal oxide layer to a magnetic elemental metal layer (Co) (col. 11, lines 55-65 and col. 4, lines 40-51). The thickness of the multilayer structure (Mn, Fe/ Al_2O_3 / Co) is determined by the number of cycles run.

Response to Arguments

2. Applicant's arguments filed 11/10/05 have been fully considered but they are not persuasive.

In response to Applicant's arguments that "Gates does not teach depositing a metal oxide layer by multiple ALD cycles follow by reduction of the metal oxide, as indicated in the above rejection, Gates clearly discloses depositing a metal oxide layer {col. 11, line 36; step 3 of the ALD cycle (iron nitrate)} by 200 ALD cycles (col. 11, lines 44-45) by reduction of the metal oxide {col. 11, lines 38-39; steps 4&5 of the ALD cycle (inert purge/hydrogen)}. Therefore, Gates clearly discloses claimed features.

Conclusion

3. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Vu whose telephone number is (571) 272-1798. The examiner can normally be reached on Monday-Friday from 8:00am to 5:00pm. If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR, Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DAVID VU
PRIMARY EXAMINER